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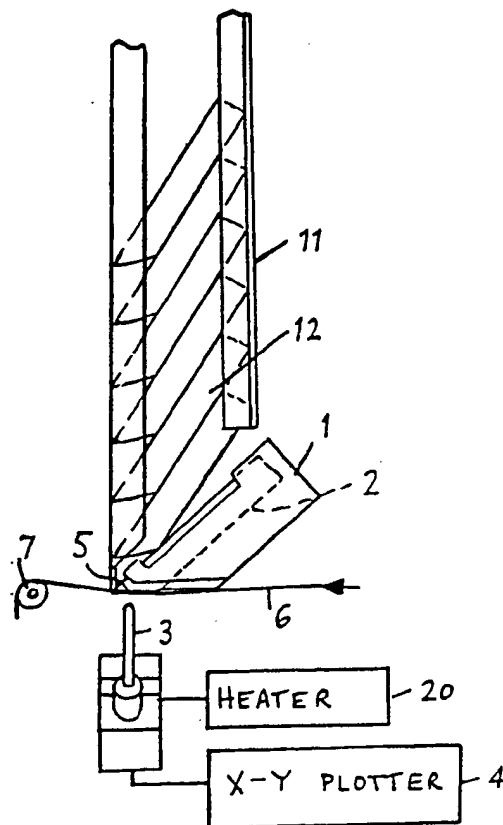
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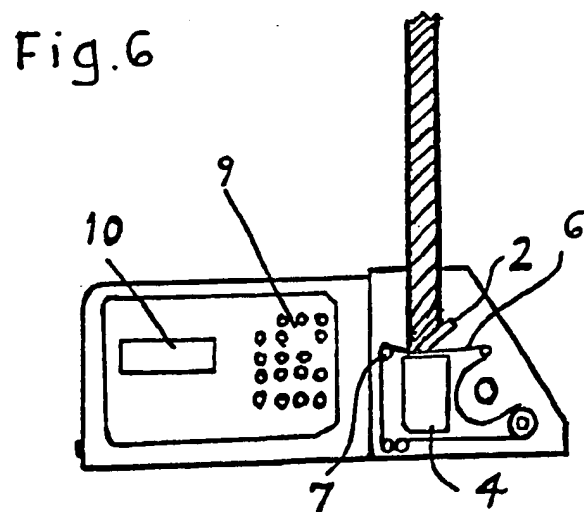
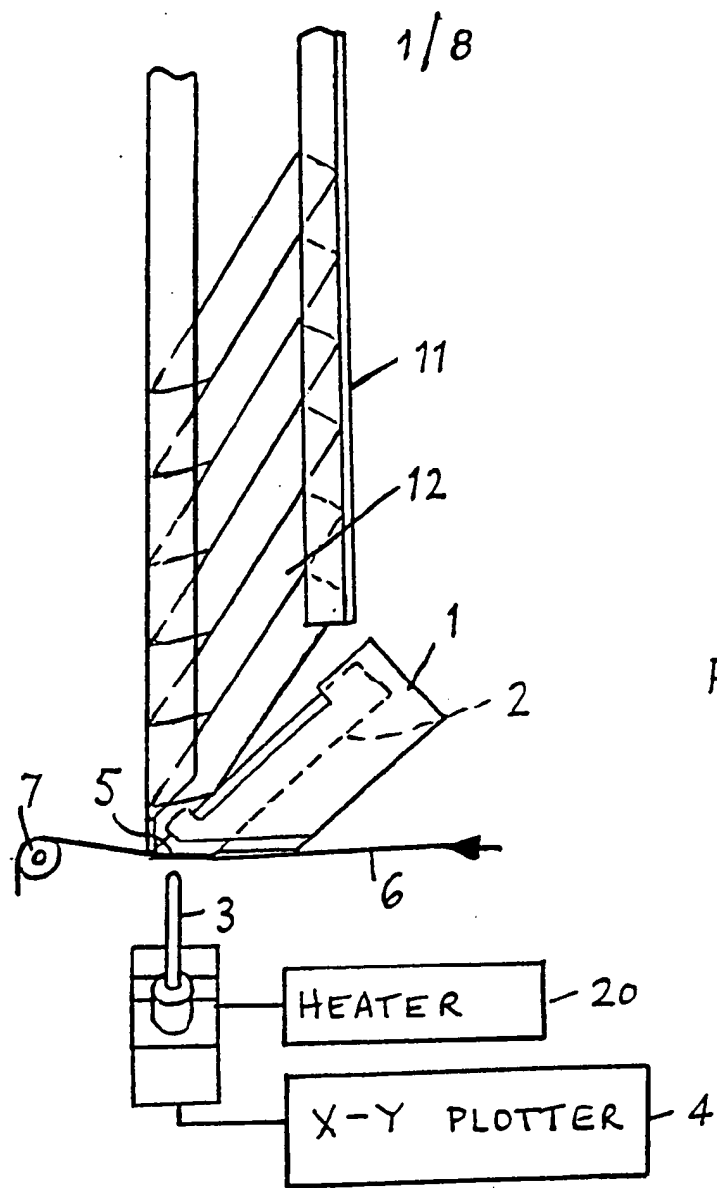
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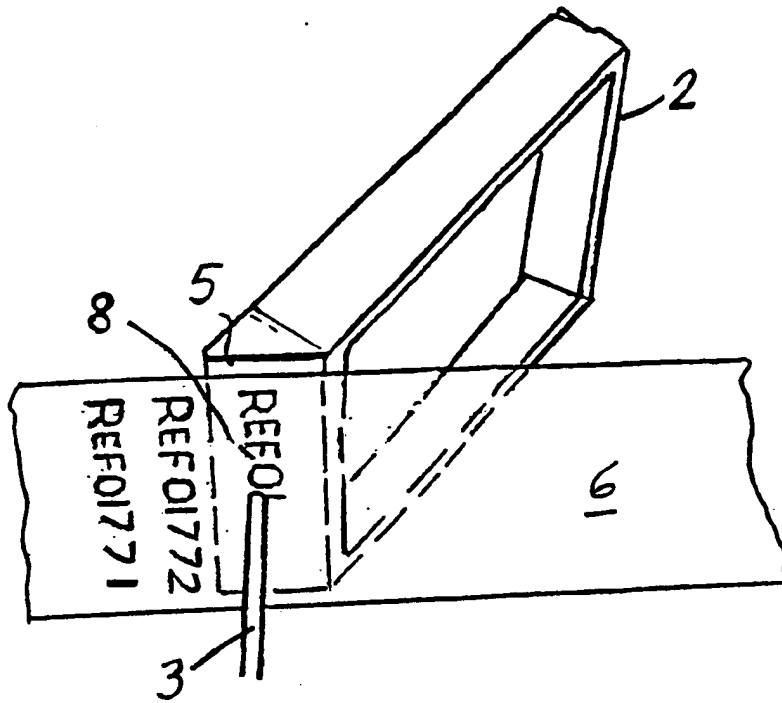
(54) **Marking supports for laboratory samples**

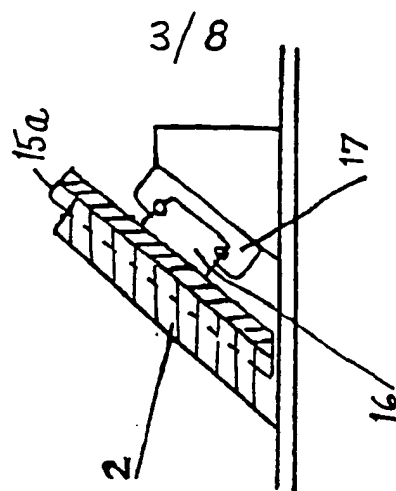
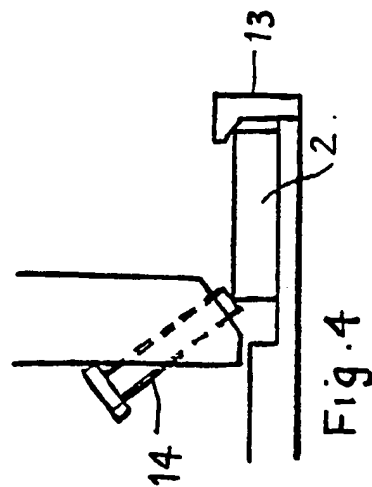
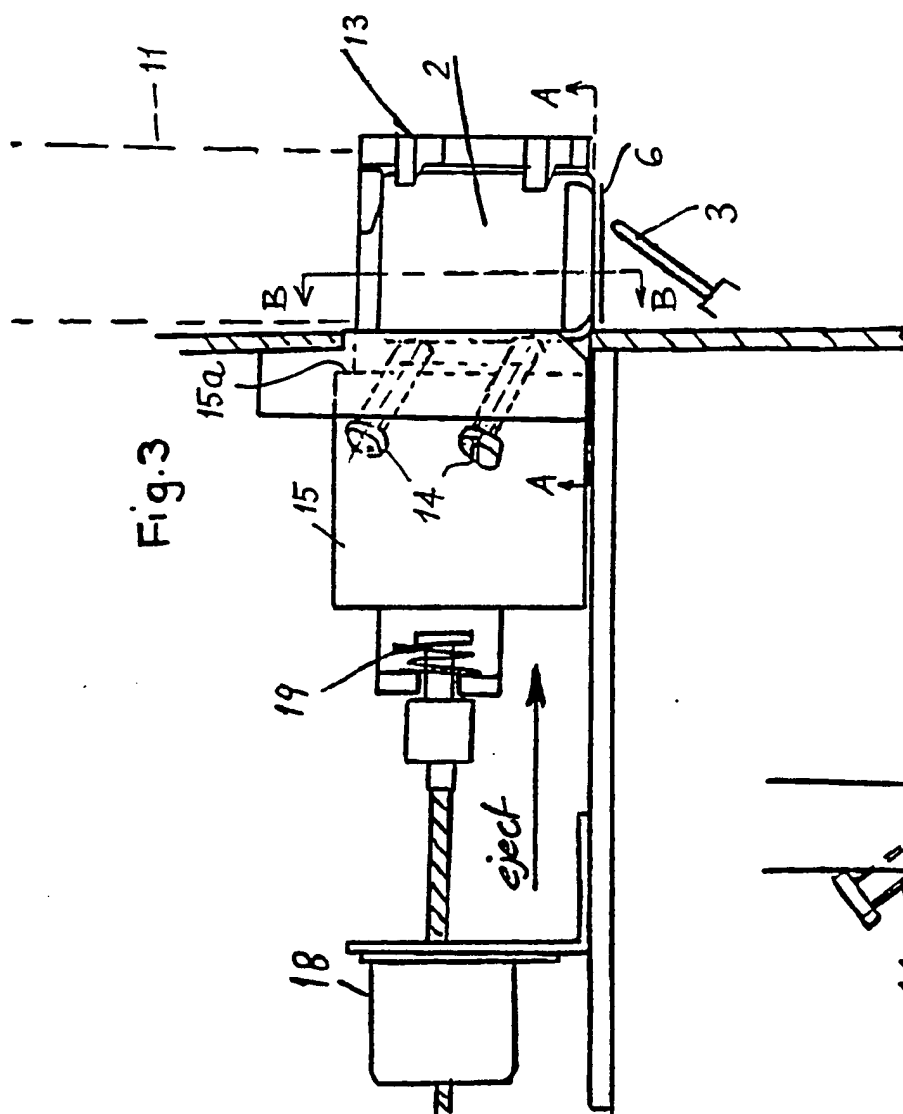
(57) A device for marking supports for laboratory samples, which in one example consists of plastic cassettes, includes a clamp 1 for securely holding a cassette 2 to enable it to be marked by a hot-foil printing technique. The technique uses a heated stylus 3 movable by a plotter mechanism 4 over a foil strip 6. A vertical hopper 11, located above the clamp 1, retains a stack of unmarked cassettes 21 and an ejector mechanism displaces the cassette 2, when marked, from the clamp 1 and positions in the clamp an unmarked cassette 12 from the bottom of the stack in the hopper 11. In another example (see Figure 7) the device is intended to mark glass slides, in which case the stylus has a rotatable diamond tip for engraving.





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Fig.7

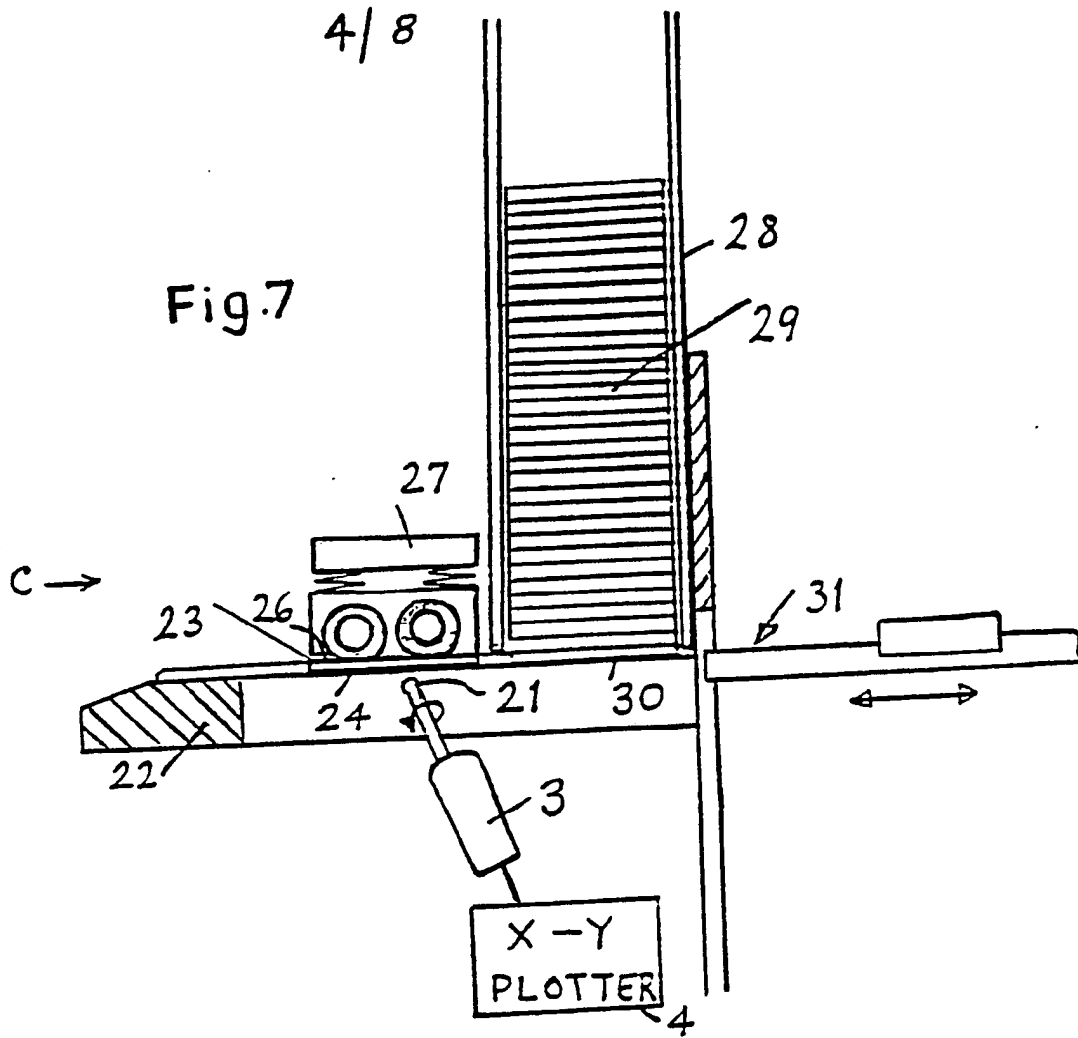
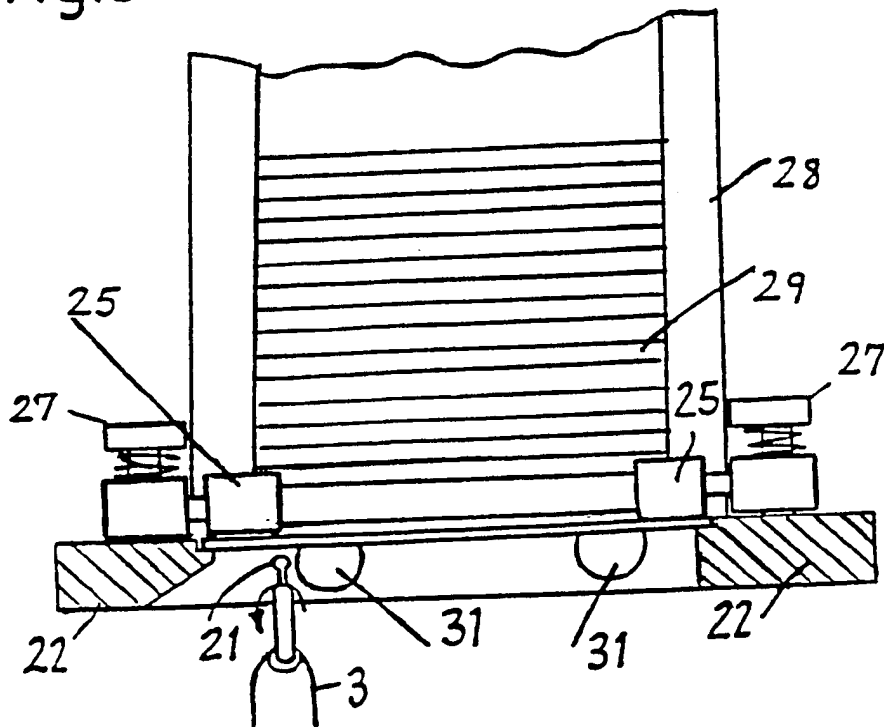


Fig.8



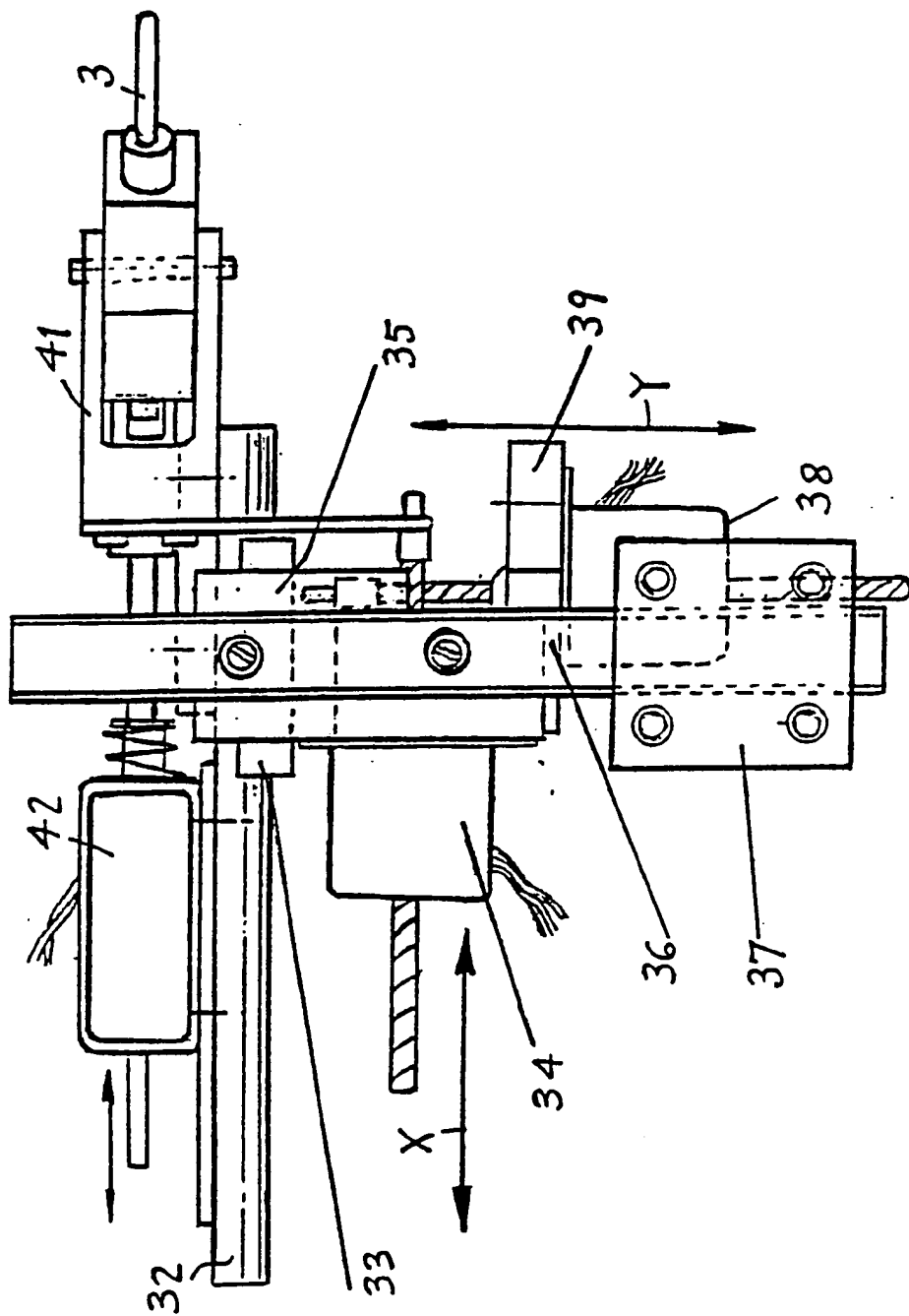


Fig.10

Fig.11a

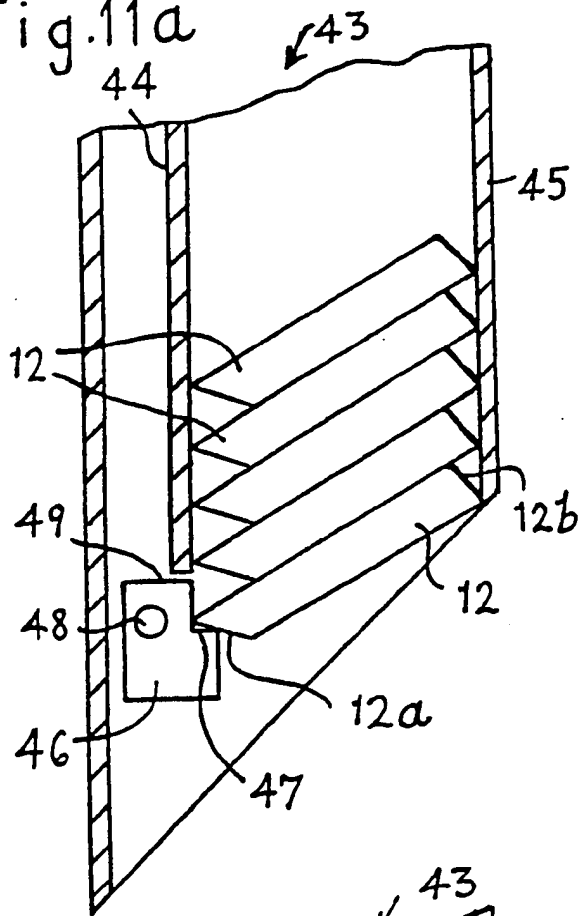


Fig.11b

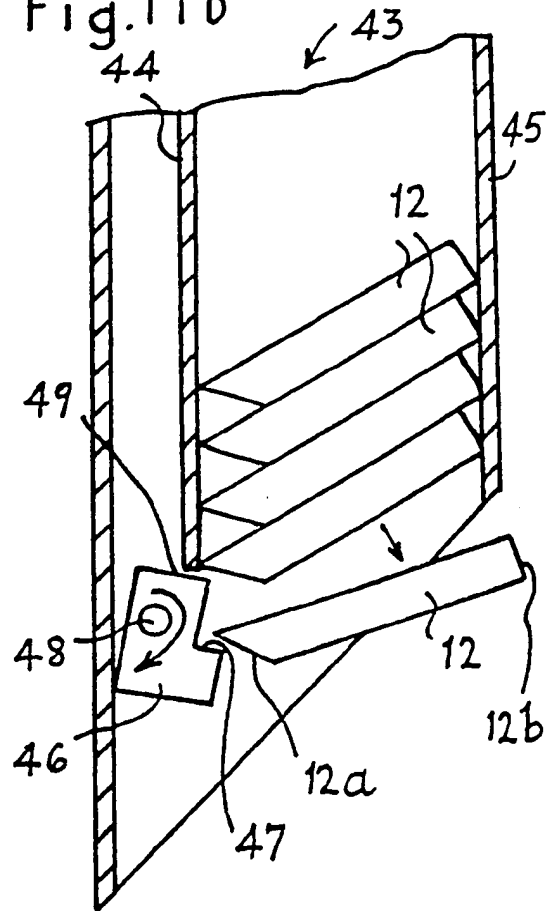


Fig.11c

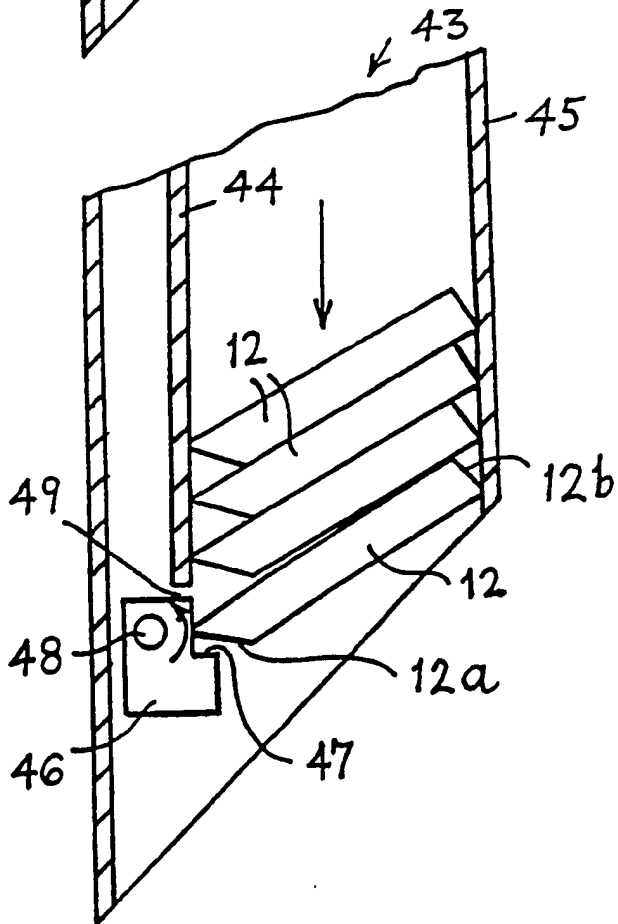
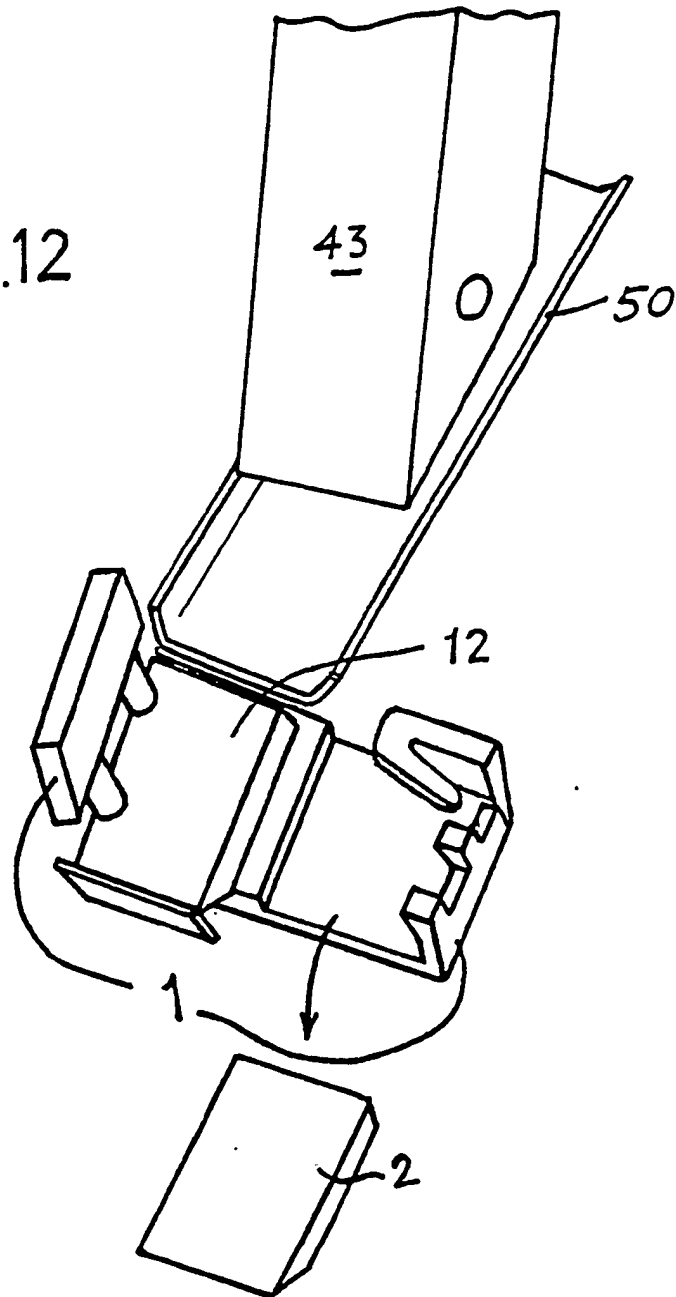


Fig.12



DEVICE FOR MARKING SUPPORTS FOR LABORATORY SAMPLES

The present invention relates to devices for marking supports for laboratory samples, for example laboratory tissue processing cassettes made of plastics material and glass laboratory or microscope slides.

There is currently a great demand for simple, quick and accurate techniques for the clear and durable marking of laboratory processing cassettes and slides. One existing method of marking plastics cassettes uses a hot-foil printing technique, in which a reference marking is stamped on a surface of the cassette by a mechanical print head. The print head consists of a number of wheels, each having a plurality of reference characters around its periphery so that different series of the characters can be selected for any particular marking. The whole of the print head is heated and is then pressed against the cassette surface with a foil strip sandwiched therebetween. However, the head of the print head together with dust from the foil strip tends to cause the mechanical print head to jam and also the type of reference is limited to the number of, as well as the characters on, the wheels of the print head. It is also necessary to position each cassette by hand in place for marking, thus making the process time-consuming.

Another known marking technique for both cassettes and slides consists of simply applying the reference using a suitable ink pen either by hand or

by using a small mechanical plotter mechanism using a belt and pulley arrangement. However, the pen markings tend to be unclear and are not necessarily durable and again the process requires the cassettes or slides to be individually handled by an operator. Furthermore, the belts of the plotter mechanism may be perished by a number of chemicals used in laboratory processes.

It is therefore an object of the present invention to provide a device for marking supports for laboratory samples, which enables batches of the supports to be marked without operator supervision, as well as being extremely flexible in the type of references that can be used by the marking.

Accordingly, one aspect of the present invention consists in a device for marking supports for laboratory samples comprising a stylus movable by a plotter mechanism for applying a selected marking to each support, means for retaining a plurality of unmarked supports, a clamp for holding a support in a position relative to the stylus to enable the held support to be marked, and means for ejecting the support when marked from the clamp and for positioning one of said unmarked supports in said clamp for marking.

In a preferred arrangement, the support retaining means comprises a generally vertical hopper for supporting a stack of unmarked supports in a position relative to the clamp. The stylus and plotter mechanism may be located beneath the clamp. The ejecting means are preferably arranged to move in a generally horizontal direction beneath the hopper to displace the marked support from the clamp and to position therein an unmarked support for marking. The hopper is preferably located above the clamp

so that an unmarked support drops down for precise positioning in the clamp by the ejecting means.

In one embodiment, the device is intended to mark supports in the form of cassettes preferably made of plastics material. In this embodiment, the stylus is heated and a foil strip is positioned between the stylus and the cassette surface to be marked such that a marking is printed on the cassette surface by movement of the heated stylus over the foil strip. The clamp may be adapted to hold the cassette at an angle to the horizontal to position the cassette surface to be marked so that it is substantially parallel to the foil strip. To this end, the clamp may consist of a resiliently-biassed claw and one or more screw members adjustably arranged to act upon the cassette to retain it securely in the required position. The hopper may have a control member disposed adjacent the lower end of the hopper for controlling the dispensing of the cassettes from the hopper. In one embodiment, the control member is rotatably mounted on the hopper and is arranged to retain the lowermost cassette of the stack in the hopper and, upon rotation, to release only the lowermost cassette from the hopper. A shoot may be provided between the hopper and the clamp for delivering an unmarked cassette to the clamp for precise positioning in the clamp by the ejecting means.

In another embodiment, the device is intended to mark supports in the form of slides preferably made of glass. To this end, the stylus has a rotatable diamond tip for engraving a selected reference on a surface of the slide. The clamp may consist of a plurality of rollers, preferably formed from rubber material, resiliently biassed to act upon the upper surface of

the slide whilst it is marked by the stylus on its under surface. The ejecting means may be adapted to push an unmarked slide from the bottom of the stack towards the clamp such that said unmarked slide displaces the marked slide from the clamp and is itself retained in the clamp for subsequent marking.

According to another aspect of the present invention, there is provided a device for marking supports for laboratory samples, in particular cassettes made of plastics material, using a hot-foil printing technique, comprising a heated stylus movable by a plotter mechanism over a foil strip to enable a selected marking to be printed on a support positioned relative thereto.

Suitably the plotter mechanism, in accordance with either aspect of the present invention, is adapted to move the stylus in two mutually perpendicular, generally horizontal directions. To this end, the mechanism includes two sliding members or sledges respectively movable in said two directions by means of a separate linear stepper motor connected directly thereto. The plotter mechanism also preferably includes means, for example a solenoid, for moving the stylus in a generally vertical direction.

The device also preferably includes user-operable means for selecting a required reference to be marked on each support, control means for controlling the marking process, and display means for displaying the reference selected.

In order that the present invention may be more readily understood, it will be described by way of

example with reference to the accompanying drawings, in which:-

Figure 1 shows schematically a side view of one embodiment of the invention,

Figure 2 shows schematically the marking technique used by the embodiment of Figure 1,

Figure 3 shows schematically a plan view of the ejecting mechanism of the embodiment of Figure 1,

Figure 4 shows a view along the line A-A in Figure 3,

Figure 5 shows a sectional view along the line B-B in Figure 3,

Figure 6 shows a schematic side view of the user-operable controls of the embodiment in Figure 1,

Figure 7 shows schematically a side view of another embodiment of the invention,

Figure 8 shows an end view in direction C in Figure 7,

Figure 9 shows schematically a side view of a plotter mechanism used in both of the embodiments illustrated,

Figure 10 shows a view along line D-D in Figure 9, and

Figures 11a to 11c show a vertical sectional view of yet another embodiment of the invention, and

Figure 12 shows schematically a perspective view of the embodiment shown in Figures 11a to 11c.

Referring first to Figures 1 to 6, a device is shown for marking laboratory processing cassettes of plastics material using a hot-foil printing technique. The device includes a clamp 1 for securely holding a cassette 2

in a position to enable it to be marked by a heated stylus 3 located therebelow and movable by an X-Y plotter mechanism 4, the operation of which will be described in more detail hereinafter. The cassette 2 is held by the clamp 1 at an angle of preferably 45° such that a cassette surface 5 is held in a position substantially parallel to foil strip 6 which is movable by rollers 7.

An operator selects a particular reference 8 to be marked on the cassette surface 5 by using a control key pad 9 and the selected reference is displayed on a display 10. The stylus 3 which is heated by any suitable heating arrangement 20 is then moved by the control of the device in X and Y directions by the plotter mechanism 4 over the surface of the foil strip 6 sandwiched between the stylus tip and the cassette surface 5, so that the selected reference is printed on the cassette surface.

A vertical hopper 11, located upon the clamp 1, retains a stack of unmarked cassettes 12 each at an angle greater than the angle of the clamped cassette so that the unmarked cassettes are gripped by the hopper. The clamp 1 consists of a resiliently-biassed claw 13 and adjustable screws 14 (Figures 3 and 4), which together act in opposed directions on the cassette 2 to hold it securely in the required position.

When the cassette 2 has been marked by the stylus 3, an ejector mechanism (Figures 3) displaces the cassette 2 from the clamp 1 and correctly positions in the clamp an unmarked cassette 12 for marking from the bottom of the stack in the hopper 2. The control also moves the foil strip 6 via the rollers 7. The marked cassette 2 is guided into a storage hopper (not shown) ready for use.

The ejector mechanism comprises a block 15 which is moved towards the clamped cassette 2 by sliding of bearing guide 16 relative to a bearing block 17 by means of a motor 18. The block 15 is biased towards the cassette 2 by a spring mechanism 19. As the block 15 is moved towards the clamped cassette 2 its shoulder 15a pushes the cassette out from under the screws 14 and the resiliently-biassed claw 13 is displaced by the pushing force to eject the marked cassette. At this point, the block 15 is directly under the hopper 11 and the unmarked cassette 12 at the bottom of the stack falls onto the block 15. The motor 18 then reverses direction and the block 15 moves back to its initial position with the unmarked cassette 12 being retained by the screws 14 and the claw 13 during the movement. The unmarked cassette is then correctly positioned in the clamp 1 for marking by the stylus 3.

Figures 7 and 8 show an alternative embodiment of the device, which is intended to mark glass laboratory or microscope slides. In this embodiment, the stylus 3, which is moved by a similar X-Y plotter mechanism 4, has a rotatable diamond tip 21 for engraving the reference, which is selected in the same manner as the first embodiment, on a surface of the slide.

In this embodiment, the clamp consists of a platform 22 upon which a slide 23 is supported, such that its under surface 24 can be engraved by the stylus 3, and a plurality of rubber rollers 25, which are resiliently biased to press down on to the upper

side surface 26 by a spring mechanism 27, hold the slide 23 securely in the correct position. A vertical hopper 28 retains a stack of unmarked slides 29, which are supported from below on the clamp platform 22, with the bottom unmarked slide 30 projecting below the open base of the hopper 28.

When the clamped slide 23 has been marked by the stylus 3, an ejector 31 is moved by a motor (not shown) towards the bottom slide 30 and pushes it towards the marked and clamped slide 23. The slide 30 thus pushes the slide 23 out from under the rollers 25 into a storage hopper (not shown) ready for use, and the slide 30 is itself retained in the clamp for marking by the stylus. The ejector 31 is moved back to its initial position and the next unmarked slide in the hopper 28 falls onto the platform 22 to continue the marking process.

Both of the embodiments described hereinabove include an X-Y plotter mechanism as shown in Figures 9 and 10. This mechanism includes an X sliding member or sledge 32 which is fixed to a bearing guide which enables the sledge to move relative to a bearing block 33.

A linear stepper motor 34 is connected to the X sledge 32 by a motor support 35 so as to move the X sledge 32 along the X direction as shown in Figure 10. The mechanism also includes a Y sliding member or sledge 36 fixed to a bearing guide which enables the Y-sledge to move relative to a bearing block 37. Another linear stepper motor 38 is connected to the Y sledge by a motor support 39 so as to move the Y

sledge in the Y direction as shown in Figure 9. The motor support 39 also supports a plate 40 upon which the ejector mechanism is mounted. Both X and Y sledges are connected to a stylus pivot block 41 so as to move the stylus 3 in the required directions to apply the selected marking. By operating both X and Y motors, the plotter is capable of moving the stylus in steps of 0.254mm (0.001") in any direction, thus enabling any graphic or textual reference, including letters, numbers and also bar codes, to be produced. The plotter mechanism also includes a solenoid 42 which can be energised to move the stylus 3 in a vertical direction perpendicular to the X and Y directions.

The device, in accordance with either embodiment, can operate as a stand-alone unit having its own built-in computer with display and key pad, as shown in Figure 6. Alternatively, the device can receive data to be used as a reference from a host computer (not shown) in similar manner to a conventional printer or plotter.

It can thus be seen that the present device provides automatic production in batches of laboratory sample supports bearing any selected reference without the need for operator supervision. This makes the device flexible and easy to use, whilst saving time and freeing the operator for other work. Furthermore, the heated stylus removes the need for conventional mechanical print heads which are of limited use and tend to jam. Additionally, the direct drive mechanism of the plotter removes the

need for belts and pulleys making the mechanism simple and robust.

Figures 11a to 11c show the successive stages of the dispensing of unmarked cassettes 12 from a hopper 43, in accordance with another embodiment of the invention. In this example, the hopper has a front face 44 and rear face 45. The unmarked cassettes 12 stacked in the hopper 43 are released one at a time from the hopper by rotating a specially shaped block 46 positioned at the bottom of the hopper tube. This block prevents any of the other cassettes in the stack from being released at the same time. Once the released cassette is clear of the hopper, the block is rotated back to its original position which causes the next cassette to drop down onto, and be retained by, the block 46.

Figure 11a shows the lowermost cassette 12 being retained within the hopper by engaging at its front end 12a with a holding surface 47 of the block 46 and at its back end 12b by frictional engagement with the rear face 45 of the hopper.

As shown in figure 11b, rotation of the block about axis 48 causes the holding surface 47 to move down and away from the bottom of the rear face 45 and causes a blocking surface 49 of the block 44 to move out into the hopper tube past the front face 44. As the holding surface 47 moves down and away from the bottom of the rear face 45, a point is reached where the back end 12b of the cassette moves past the bottom of the rear face 45 of the hopper, which causes the lowermost cassette to fall out of the hopper back end first. Before the point is reached where the lowermost cassette falls out of the hopper, the blocking surface 49 has moved out into the hopper tube and prevents the

next cassette in the stack from moving down or falling out of the hopper.

Once the lowermost cassette has fallen out of the hopper, the block is rotated back to its holding position as shown in Figure 11c. When the blocking surface 49 moves back past the hopper front face 44, the next cassette, which had been blocked by the blocking surface 49, drops until it comes into engagement with the holding surface 47.

In the embodiment shown in Figures 11a to 11c, the clamp and ejector mechanism are the same as that used in the embodiment in Figures 1 to 6, but in this embodiment the hopper is not intended to be located directly above the clamp as in the embodiment shown in Figures 1 to 6. As shown in Figure 12, in this embodiment the hopper 43 is located above, but to one side of, the clamp 1, and a shoot 50 is provided for delivering an unmarked cassette 12 from the bottom of the stack in the hopper 43 to the clamp 1. The ejector mechanism (not shown in Figure 12) is then used for precisely positioning the unmarked cassette in the clamp for subsequent marking, whilst the marked cassette 2 is ejected. In this arrangement, an individual cassette for marking may also be manually delivered down the shoot into the clamp, in between the dispensing of the cassettes from the hopper. Furthermore, this embodiment enables the hopper to be removable from the device, so that the hopper can be used for storing the cassettes stacked therein.

Whilst particular embodiments of the present invention have been described, it will be understood that modifications may be made without departure from the scope of the invention.

CLAIMS

(1) A device for marking supports for laboratory samples comprising a stylus movable by a plotter mechanism for applying a selected marking to each support, means for retaining a plurality of unmarked supports, a clamp for holding a support in a position relative to the stylus to enable the held support to be marked, and means for ejecting the support when marked from the clamp and for positioning one of said unmarked supports in said clamp for marking.

(2) A device as claimed in claim 1, wherein the support retaining means comprises a generally vertical hopper for supporting a stack of unmarked supports in a position relative to the clamp.

(3) A device as claimed in claim 2, wherein the ejecting means are arranged to move in a generally horizontal direction to displace the marked support from the clamp and then also to position therein an unmarked support for marking.

(4) A device as claimed in claim 2 or 3, wherein the hopper is located above the clamp so that an unmarked support drops down for precise positioning in the clamp by said ejecting means.

(5) A device as claimed in claim 1, 2, 3 or 4, wherein one or both of the stylus and the plotter mechanism are located beneath the clamp.

(6) A device as claimed in any preceding claim, wherein the device is intended to mark supports in the form of cassettes preferably made of plastics material, the stylus is heated and a foil strip is positioned between the stylus and the cassette surface to be marked such that a marking is printed on the cassette surface by movement of the heated stylus over the foil strip.

(7) A device as claimed in claim 6, wherein the clamp is adapted to hold the cassette at an angle to the horizon-

tal so as to position the cassette surface to be marked so that it is substantially parallel to the foil strip.

(8) A device as claimed in claim 7, wherein the clamp consists of a resiliently-biassed claw and one or more screw members adjustably arranged to act upon the cassette to retain it securely in the required position.

(9) A device as claimed in any one of claims 6 to 8, wherein the cassette retaining means comprises a generally vertical hopper for supporting a stack of unmarked cassettes, the hopper having a control member disposed adjacent the lower end of the hopper for controlling the dispensing of the cassettes from the hopper.

(10) A device as claimed in claim 9, wherein the control member is rotatably mounted on the hopper and is arranged to retain the lowermost cassette of the stack in the hopper and, upon rotation, to release only the lowermost cassette from the hopper.

(11) A device as claimed in claim 9 or 10, wherein the hopper is located above the clamp and a shoot is provided between the hopper and the clamp for delivering an unmarked cassette to the clamp for precise positioning by said ejecting means.

(12) A device as claimed in any one of claims 1 to 5, wherein the device is intended to mark supports in the form of slides, preferably made of glass, the stylus has a rotatable diamond tip for engraving a selected reference on a surface of the slide.

(13) A device is claimed in claim 12, wherein the clamp consists of a plurality of rollers, preferably formed from rubber material, resiliently biassed to act upon the upper surface of the slide whilst it is marked by the stylus on its under surface.

(14) A device as claimed in claim 12 or 13, wherein the ejecting means are adapted to push an unmarked slide from the bottom of the stack towards the clamp such that said unmarked slide displaces the marked slide from the clamp

and is itself retained in the clamp for subsequent marking.

(15) A device for marking supports for laboratory samples, in particular cassettes made of plastics material, using a hot-foil printing technique, comprising a heated stylus movable by a plotter mechanism over a foil strip to enable a selected marking to be printed on a support positioned relative thereto.

(16) A device as claimed in any preceding claim, wherein the plotter mechanism is adapted to move the stylus in two mutually perpendicular, generally horizontal directions.

(17) A device as claimed in claim 16, wherein the plotter mechanism includes two sliding members, such as sledges, respectively movable in said two directions by means of a separate linear stepper motor connected directly thereto.

(18) A device as claimed in claim 16 or 17, wherein the plotter mechanism also includes means, for example a solenoid, for moving the stylus in a generally vertical direction.

(19) A device as claimed in any preceding claim, including user-operable means for selecting a required reference to be marked on each support, control means for controlling the marking process, and displays means for displaying the reference selected.

(20) A device for marking supports for laboratory samples substantially as herein described with reference to Figures 1 to 6 or Figures 7 and 8 or Figures 9 and 10 or Figures 11a to 11c and 12.